Notice of Allowability	Application No.	Applicant(s)	
	09/679,023	WANG ET AL.	
	Examiner	Art Unit	
	Jennine M. Brown	1755	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the inteview summary of 09/08/2004*.

2. ☒ The allowed claim(s) is/are *65-98*.

3. ☒ The drawings filed on *04 October 2000* are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☒ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
   1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *9/8/2004* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Mark L. Bell
Supervisory Patent Examiner
Technology Center 1700

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Peng Chen on 9/8/2004.

The application has been amended as follows:

Cancel claims 1-64.

Replace the previously pending version of claims 65-78 with the following:

Claim 65 (Currently Amended): A method of discriminating a matter using electrophoretic and acoustic forces in field flow fractionation, which method comprises:

a) obtaining an apparatus ~~of claim 25~~, which apparatus comprises:

i) a chamber having at least one inlet port and at least one outlet port, said chamber having such structural characteristics that when a carried medium is caused to travel through said chamber, the traveling velocity of said carried medium at various positions within said chamber is different;

ii) at least two stationary electrode elements adapted along a portion of said chamber, wherein said electrode elements can be energized via at least one electrical signal provided by a first electrical signal generator to create an

electrical field, thereby causing at least one electrophoretic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium; and

iii) at least one stationary piezoelectric transducer adapted along a portion of said chamber, wherein said piezoelectric transducer can be energized via at least one electrical signal provided by a second electrical signal generator to create an acoustic wave, thereby causing at least one acoustic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium.

wherein said first electrical signal generator and said second electrical signal generator are different electrical signal generators;

b) introducing a carrier medium containing a matter to be discriminated into the chamber of the apparatus ~~of claim 25~~ obtained in a) via its inlet port, wherein said introducing causes the carrier medium to travel through the chamber according to a velocity profile;

c) applying at least one electrical signal provided by a said first electrical signal generator to the electrode elements, wherein said energized electrode elements create an electrical field, thereby causing at least one electrophoretic force on said matter having components normal to the traveling direction of said carrier medium traveling through said chamber; and

d) applying at least another electrical signal provided by ~~a~~ said second electrical signal generator to the piezoelectric transducer, wherein said energized piezoelectric transducer creates an acoustic wave, thereby causing at least one acoustic force on said matter having components normal to the traveling direction of said carrier medium traveling through said chamber,

~~wherein the first electrical signal generator and the second electrical signal generator are different electrical signal generators;~~

whereby said matter is displaced to positions within said carrier medium along a direction normal to the traveling direction of said carrier medium traveling through said chamber and discriminated according to its position within said carrier medium along the direction normal to the traveling direction of said carrier medium traveling through said chamber.

Claim 66 (Original): The method of claim 65, wherein the electrophoretic force and the acoustic force are generated simultaneously.

Claim 67 (Original): The method of claim 65, wherein the electrophoretic force and the acoustic force are generated sequentially.

Claim 68 (Currently Amended): A method of discriminating a matter using electrophoretic and acoustic forces in field flow fractionation, which method comprises:

a) obtaining an apparatus ~~of claim 25~~, which apparatus comprises:

i) a chamber having at least one inlet port and at least one outlet port, said chamber having such structural characteristics that when a carried medium is caused to travel through said chamber, the traveling velocity of said carried medium at various positions within said chamber is different;

ii) at least two stationary electrode elements adapted along a portion of said chamber, wherein said electrode elements can be energized via at least one electrical signal provided by a first electrical signal generator to create an electrical field, thereby causing at least one electrophoretic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium; and

iii) at least one stationary piezoelectric transducer adapted along a portion of said chamber, wherein said piezoelectric transducer can be energized via at least one electrical signal provided by a second electrical signal generator to create an acoustic wave, thereby causing at least one acoustic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium,

wherein said first electrical signal generator and said second electrical signal generator are different electrical signal generators;

b) loading a carrier medium into the chamber of apparatus ~~of claim 25~~ obtained in a) via its inlet port until the chamber is filled with the carrier medium;

c) delivering a sample that contains a matter to be discriminated into the carrier medium in the chamber;

d) applying at least one electrical signal provided by ~~a~~ said first electrical signal generator to the electrode elements, wherein said energized electrode elements create an electrical field, thereby causing at least one electrophoretic force on said matter;

e) applying at least another electrical signal provided by ~~a~~ said second electrical signal generator to the piezoelectric transducer, wherein said energized piezoelectric transducer creates an acoustic wave, thereby causing at least one acoustic force on said matter;

f) introducing the carrier medium into the chamber of the apparatus via its inlet port, wherein said introducing causes the carrier medium to travel through the chamber according to a velocity profile,

~~wherein the first electrical signal generator and the second electrical signal generator are different electrical signal generators;~~

whereby said matter is displaced to positions within said carrier medium along a direction normal to the traveling direction of said carrier medium traveling through said chamber and discriminated according to its position within

said carrier medium along the direction normal to the traveling direction of said carrier medium traveling through said chamber.

Claim 69 (Original): The method of claim 68, wherein applying electrical signal to the electrode elements to cause at least one electrophoretic force on said matter and applying electrical signal to the piezoelectric transducer to cause at least one acoustic force on said matter result in the matter being displaced into equilibrium position along a direction normal to the traveling direction of the carrier medium traveling through the chamber, prior to the introducing of carrier medium into the chamber that causes the carrier medium to travel through the chamber according to a velocity profile.

Claim 70 (Original): The method of claim 68, wherein the electrophoretic force and the acoustic force are generated simultaneously.

Claim 71 (Original): The method of claim 68, wherein the electrophoretic force and the acoustic force are generated sequentially.

Claim 72 (Currently Amended): A method of discriminating a matter using dielectrophoretic and acoustic forces in field flow fractionation, which method comprises:

a) obtaining an apparatus ~~of claim 44~~, which apparatus comprises:

i) a chamber having at least one inlet port and at least one outlet port, said chamber having such structural characteristics that when a carried medium is caused to travel through said chamber, the traveling velocity of said carried medium at various positions within said chamber is different;

ii) at least two stationary electrode elements adapted along a portion of said chamber, wherein said electrode elements can be energized via at least one electrical signal provided by a first electrical signal generator to create a non-uniform electrical field, thereby causing at least one dielectrophoretic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium; and

iii) at least one stationary piezoelectric transducer adapted along a portion of said chamber, wherein said piezoelectric transducer can be energized via at least one electrical signal provided by a second electrical signal generator to create an acoustic wave, thereby causing at least one acoustic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium,

wherein said first electrical signal generator and said second electrical signal generator are different electrical signal generators;

b) introducing a carrier medium containing a matter to be discriminated into the chamber of the apparatus ~~of the claim 44~~ obtained in a) via its inlet port,

wherein said introducing causes the carrier medium to travel through the chamber according to a velocity profile;

c) applying at least one electrical signal provided by ~~a~~ said first electrical signal generator to the electrode elements, wherein said energized electrode elements create a non-uniform electrical field, thereby causing at least one dielectrophoretic force on said matter having components normal to the traveling direction of said carrier medium traveling through said chamber; and

d) applying at least another electrical signal provided by ~~a~~ said second electrical signal generator to the piezoelectric transducer, wherein said energized piezoelectric transducer creates an acoustic wave, thereby causing at least one acoustic force on said matter having components normal to the traveling direction of said carrier medium traveling through said chamber,

~~wherein the first electrical signal generator and the second electrical signal generator are different electrical signal generators;~~

whereby said matter is displaced to positions within said carrier medium along a direction normal to the traveling direction of said carrier medium traveling through said chamber and discriminated according to its position within said carrier medium along the direction normal to the traveling direction of said carrier medium traveling through said chamber.

Claim 73 (Original): The method of claim 72, wherein the dielectrophoretic force and the acoustic force are generated simultaneously.

Claim 74 (Original): The method of claim 72, wherein the dielectrophoretic force and the acoustic force are generated sequentially.

Claim 75 (Currently Amended): A method of discriminating a matter using dielectrophoretic and acoustic forces in field flow fractionation, which method comprises:

a) obtaining an apparatus ~~of claim 44~~, which apparatus comprises:

i) a chamber having at least one inlet port and at least one outlet port, said chamber having such structural characteristics that when a carried medium is caused to travel through said chamber, the traveling velocity of said carried medium at various positions within said chamber is different;

ii) at least two stationary electrode elements adapted along a portion of said chamber, wherein said electrode elements can be energized via at least one electrical signal provided by a first electrical signal generator to create a non-uniform electrical field, thereby causing at least one dielectrophoretic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium; and

iii) at least one stationary piezoelectric transducer adapted along a portion of said chamber, wherein said piezoelectric transducer can be energized via at least one electrical signal provided by a second electrical signal generator to create an acoustic wave, thereby causing at least one acoustic force having components normal to the traveling direction of said carrier medium on a matter in said carrier medium,

wherein said first electrical signal generator and said second electrical signal generator are different electrical signal generators;

b) loading a carrier medium into the chamber of the apparatus ~~of claim 44~~ obtained in a) via its inlet port until the chamber is filled with the carrier medium;

c) delivering a sample that contains a matter to be discriminated into the carrier medium in the chamber;

d) applying at least one electrical signal provided by ~~a~~ said first electrical signal generator to the electrode elements, wherein said energized electrode elements create an electrical field, thereby causing at least one dielectrophoretic force on said matter;

e) applying at least another electrical signal provided by ~~a~~ said second electrical signal generator to the piezoelectric transducer, wherein said energized piezoelectric transducer creates an acoustic wave, thereby causing at least one acoustic force on said matter;

f) introducing the carrier medium into the chamber of the apparatus via its inlet port, wherein said introducing causes the carrier medium to travel through the chamber according to a velocity profile,

~~wherein the first electrical signal generator and the second electrical signal generator are different signal generators;~~

whereby said matter is displaced to positions within said carrier medium along a direction normal to the traveling direction of said carrier medium traveling through said chamber and discriminated according to its position within said carrier medium along the direction normal to the traveling direction of said carrier medium traveling through said chamber.

Claim 76 (Original): The method of claim 75, wherein applying electrical signal to the electrode elements to cause dielectrophoretic force on said matter and applying electrical signal to the piezoelectric transducer to cause acoustic force on said matter result in the matter being displaced into equilibrium position along a direction normal to the traveling direction of the carrier medium traveling through the chamber, prior to the introducing of carrier medium into the chamber that causes the carrier medium to travel through the chamber according to a velocity profile.

Claim 77 (Original): The method of claim 75, wherein the dielectrophoretic force and the acoustic force are generated simultaneously.

Claim 78 (Original): The method of claim 75, wherein the dielectrophoretic force and the acoustic force are generated sequentially.

Add the following **new claims**:

Claim 79 (New): The method of claim 65, wherein the apparatus comprises more than two electrode elements.

Claim 80 (New): The method of claim 65, wherein each of more than two electrode elements in the apparatus is individually connected to one of a plurality of electrical conductor buses electrically connected to the electrical signal generator.

Claim 81 (New): The method of claim 65, wherein the electrode elements in the apparatus are adapted substantially longitudinally or latitudinally along a portion of the chamber.

Claim 82 (New): The method of claim 65, wherein the electrode elements in the apparatus are adapted along the interior surface of the chamber.

Claim 83 (New): The method of claim 65, wherein the electrode elements in the apparatus are configured on a plane substantially parallel to the traveling direction of carrier medium caused to travel through said chamber.

Claim 84 (New): The method of claim 65, wherein the electrode elements in the apparatus form an electrode array, said electrode array is selected from an interdigitated electrode array, interdigitated castellated electrode array, interdigitated electrode array having periodic triangular shaped tips on the electrode elements, interdigitated electrode array having periodic arc shaped tips on the electrode elements.

Claim 85 (New): The method of claim 65, wherein the electrode elements in the apparatus are a metal layer coated on a surface of the chamber.

Claim 86 (New): The method of claim 85, wherein the metal is selected from a group of gold, platinum, aluminum, chromium, titanium, copper and silver.

Claim 87 (New): The method of claim 65, wherein the first electrical signal generator in the apparatus for energizing the electrode elements to create the electrophoretic force is a DC signal source capable of varying magnitude of DC voltage, or is a AC signal source capable of varying magnitude and frequency, of said electrical signals.

Claim 88 (New): The method of claim 65, wherein file first electrical signal in the apparatus for energizing the electrode elements to create the electrophoretic force is a DC electrical signal or a low frequency AC signal.

Claim 89 (New): The method of claim 65, wherein the chamber comprises a tube.

Claim 90 (New): The method of claim 89, wherein the electrode elements and/or the piezoelectric transducer, or a plurality thereof, are adapted along the interior surface of the tube.

Claim 91 (New): The method of claim 89, wherein the electrode elements and/or the piezoelectric transducer, or a plurality thereof, are adapted along the exterior surface of the tube.

Claim 92 (New): The method of claim 65, wherein the chamber comprises a top wall, a bottom wall, and two side walls and the electrode elements and/or the piezoelectric transducer, or a plurality thereof, are configured on the top wall of the chamber.

Claim 93 (New): The method of claim 65, wherein the chamber comprises a top wall, a bottom wall, and two side walls and the electrode elements and/or the piezoelectric transducer, or a plurality thereof, are configured on the bottom wall of the chamber.

Claim 94 (New): The method of claim 65, wherein file electrode elements and/or the piezoelectric transducer, or a plurality thereof, is adapted on opposing surfaces of the chamber.

Claim 95 (New): The method of claim 72, wherein the apparatus comprises more than two electrode elements.

Claim 96 (New): The method of claim 72, wherein each of more than two electrode elements in the apparatus is individually connected to one of a plurality of electrical conductor buses electrically connected to the electrical signal generator.

Claim 97 (New): The method of claim 72, wherein the electrode elements in the apparatus further creates a spatially inhomogeneous electric field.

Claim 98 (New): The method of claim 72, wherein the first electrical signal generator in the apparatus for energizing the electrode elements to create the

dielectrophoretic force is capable of varying magnitude, and frequency of said electrical signals.

Allowable Subject Matter

Claims 65-98 are allowed.

The following is an examiner's statement of reasons for allowance:

Prior art of record fails to teach or suggest a method of separation whereby both an acoustic and electrophoretic force are used simultaneously in an open system having stationary piezoelectric transducers for generating acoustic force, the traveling velocity of a carried medium at various positions is different and that the electrophoretic force has components normal to the traveling direction of the carrier medium.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennine M. Brown whose telephone number is (571) 272-1364. The examiner can normally be reached on M-F 8:00 AM - 6:00 PM; first Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Bell can be reached on (571) 272-1700. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jmb

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